REMARKS

The present response is intended to be fully responsive to all points of rejection raised by the Examiner and is believed to place the application in condition for allowance. Favorable reconsideration and allowance of the application is respectfully requested.

Claims 1-74 are pending in this case. Claims 18-31 have been rejected under 35 U.S.C. § 112, first paragraph. Claims 20, 34, 44-45, 65, 55-57 have been rejected under 35 U.S.C. § 112, second paragraph. Claims 49-51, 54, 60-64, 67-71 have been rejected under 35 U.S.C. § 102(e). Claims 55-59 have been rejected under 35 U.S.C. § 103(a). Claims 1-17, 32-33, 35-43, 46-48 have been allowed. Independent claims 18, 49, 54 and 69 and dependent claims 20, 34, 36, 44, 47, 55-57, 65 have been amended.

Information Disclosure Statement

The Examiner indicated that several references were missing from the information disclosure statement filed April 17, 2001. These references were included in the information disclosure statement mailed April 17, 2001 with Express Mail Label No. EL853599702US and somehow got separated from the file. Applicant submits copies of the 20 missing references with this Response. Applicant requests that the missing references be considered as if received by the US PTO on April 17, 2001.

Response to Claim Objections

The Examiner objected to claims 18-31, 36, 47 due to several informalities. Applicant has amended these claims accordingly. Applicant respectfully submits that the claim amendments overcome the Examiner's objection to the claims. The Examiner is respectfully requested to withdraw the objection to the claims.

Response to 35 U.S.C. § 112, First Paragraph Rejections

The Examiner rejected claims 18-31 under 35 U.S.C. § 112, first paragraph, as failing to comply with the enablement requirement wherein the claim(s) contain subject matter which was not described in the specification in such a sway as to enable one skilled in the art to which it pertains to make and/or use the invention.

Specifically, the Examiner asserts that the specification lacks a description in which there is a Euclidean distance calculated to determine the symbol closest to the most likely symbol. It is submitted that the term Euclidean distance is a well know term that defines the distance between two points. For example, the Euclidean distance between two points in two dimensions is simply the

straight line distance between the two points and can be calculated by taking the square root of the sum of the squares of the differences between the two points in both the X and Y dimensions. In the case of N dimensions, it is well known that the Euclidean distance between any two points p and q is defined mathematically as $\sqrt{\left(\sum_{i=1}^{N}(p_i - q_i)^2\right)}$ where p_i and q_i are the coordinates of p and q in dimension i, respectively. The term "closest in Euclidean distance" means the same as and is synonymous with the term "nearest neighbor" as described in the specification on page 21, lines 17-24. In addition, the term Euclidean distance is disclosed in the Summary of the Invention section on page 6, line 30.

Thus, there is sufficient support in the specification for the term "Euclidean distance" as used in claim 18. Applicant believes that claims 18-31 overcome the Examiner's § 112, first paragraph rejection. The Examiner is respectfully requested to withdraw the rejection based on § 112, first paragraph.

Response to 35 U.S.C. § 112, Second Paragraph Rejections

The Examiner rejected claims 20, 34, 44-45, 65, 55-57 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention.

Amended claims 20, 34, 44-45, 65, 55-57 now feature language which make it clear what the subject matter is that the Applicant regards as the invention. Applicant believes that amended claims 20, 34, 44-45, 65, 55-57 overcome the Examiner's rejection based on § 112, second paragraph grounds. The Examiner is respectfully requested to withdraw the § 112, second paragraph rejection.

Response to 35 U.S.C. § 102(e) Rejections

The Examiner rejected claims 49-51, 54, 60-64, 67-71 under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,625,236 ("Dent et al."). Applicant respectfully submits that the prior art fails to disclose or suggest at least a method of generating soft bit values using soft symbol values represented as symbol log likelihood ratios. Therefore, Applicant respectfully traverses the rejections and request favorable reconsideration.

While continuing to traverse the Examiner's rejections, Applicant, in order to expedite the prosecution, has chosen to clarify and emphasize the crucial distinctions between the present invention and the devices of the patents cited by the Examiner. Specifically, representative claim 49 has been amended to include a method of generating soft bit outputs from soft symbol values, the

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method comprising the steps of receiving for each symbol a plurality of soft symbol values represented as **symbol log likelihood ratios**, determining, for each bit in the symbol, a first likelihood representing the probability that the bit is a one, the first likelihood determined based on the symbol log likelihood ratios, determining, for each bit in the symbol, a second likelihood representing the probability that the bit is a zero, the second likelihood determined based on the symbol log likelihood ratios and computing a soft bit value for the bit as a function of the first likelihood and the second likelihood.

Dent et al teaches a method of decoding multibit symbols from a signal received on a communications channel by combining a matched filtered signal derived from the input signal samples and hard decisions derived from the input signal samples to obtain soft symbol values. The soft symbol values are processed further to obtain soft bit values for each bit of the multibit symbols.

It is submitted that although the goal of Dent et al. is to calculate soft bit values, the soft bit values are determined in a manner substantially different than that used by the present invention. Dent et al. determines soft bit values by summing of the possible values of the bits themselves. Dent et al. is operative to calculate a complex value per symbol which has no well defined statistical interpretation. This value is then used to calculate log likelihoods of every bit comprising the symbol. The expressions for the three bit values of B1 (col. 7, line 60), B2 (col. 8, line 5) and B3 (col. 8, line 37) all are a function of complex values including symbols S(k) and entities I and Q. The I and Q entities are a function of the three bit values and a constellation shift of 22.5 degrees (see col. 7, lines 21-31). It is also noted that all three expressions for soft bit values include summations over all possible values of a bit (i.e. B3 for bits 1 and 2, and B1 and B2 for bit 3).

In contrast, the method of the present invention is based on the assumption that for a particular symbol, the likelihoods of all possible symbol values is known (also in the case when the symbol values are compared to a particular reference symbol value). The symbol values are log likelihood ratios which are **real** entities and **not** complex numbers and have a well defined statistical interpretation. The log likelihood of each bit in a symbol is calculated using these symbol log likelihood ratios. Thus, the summations in Equation 8 are over all possible likelihoods for which a particular bit has a certain value (i.e. 0 or 1). This method of determining the soft bit values is very different than that of Dent et al. and is neither taught nor suggested by Dent et al.

Amended independent claims 49, 54, 69 include the limitation of the step of receiving for each symbol a plurality of soft symbol values represented as symbol log likelihood ratios which is not taught by the Dent et al. reference. It is thus believed that amended independent claims 49, 54, 69 overcome the Examiner's § 102(e) rejection based on the Dent et al. reference. In addition, it is

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believed that amended claims 50-51, 60-64, 67-68, 70-71 also overcome the Examiner's rejection based on § 102(e) grounds. The Examiner is respectfully requested to withdraw the rejection based on § 102(e).

Response to 35 U.S.C. § 103(a) Rejections

The Examiner rejected claims 55-59 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,625,236 ("Dent et al."). Applicant respectfully submits that the prior art fails to disclose or suggest at least a method of generating soft bit values using soft symbol values represented as symbol log likelihood ratios. Therefore, Applicant respectfully traverses the rejections and request favorable reconsideration.

Based on the argument made above regarding independent claims 49, 54, 69 Applicant submits that independent claim 54 and is not obvious in light of Dent et al. Claims 55-59 depend from claim 54. Accordingly, Applicant also submits that claims 55-59 are not obvious in light of Dent et al. as well. The Applicant respectfully traverses the rejection of claims 55-59 and submit that the presently claimed invention is patently distinct over Dent et al.. The Examiner is respectfully requested to withdraw the rejection based on 35 U.S.C. §103(a).

Correction of Typographical Errors

Amendments haven been made to correct grammatical and usage errors in the specification. No new matter has been added to the application by these amendments.

Conclusion

In view of the above amendments and remarks, it is respectfully submitted that independent claims 1, 18, 32, 49, 54, 69 and hence dependent claims 2-17, 19-31, 33-48, 50-53, 55-68, 70-74 are now in condition for allowance. Prompt notice of allowance is respectfully solicited.

In light of the Amendments and the arguments set forth above, Applicant earnestly believes that they are entitled to a letters patent, and respectively solicit the Examiner to expedite prosecution

of this patent applications to issuance. Should the Examiner have any questions, the Examiner is encouraged to telephone the undersigned.

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Respectfully submitted,

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